

M1000-6/USB

Signal Conditioning and Data Acquisition

System User Guide

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SECTION 1 - INTRODUCTION

This manual has been produced to allow the User to make full use of the Micro Movements M1000 Series Signal Conditioning System. It is not intended that the User should undertake major maintenance, for which the System should be returned to Micro Movements. Consequently some of the technical descriptions and maintenance procedures are not explained in full.

For further details on Maintenance and Fault Finding please refer to the Service Manual.

This manual is divided into 5 sections, which cover:

Introduction

Description

Set Up

Operation

Software Installation



WARNING

HEALTH AND SAFETY AT WORK

MICRO MOVEMENTS LIMITED HAVE ENSURED THAT, AS FAR AS PRACTICABLE, ANY PERSON CARRYING OUT NORMAL MAINTENANCE OPERATIONS ON THE ABOVE SYSTEM IS NOT EXPOSED TO ANY UNDUE HAZARD FROM ELECTRIC SHOCK OR PERSONAL INJURY.

HOWEVER, MAINTENANCE AND/OR SERVICING OPERATIONS MAY INVOLVE REMOVAL OF COVERS OR DISASSEMBLY OF COMPONENTS. UNDER SUCH CONDITIONS THE INTEGRITY OF THE EQUIPMENT MAY BE IMPAIRED. **MICRO MOVEMENTS** THEREFORE RECOMMEND THAT MAINTENANCE IS ONLY CARRIED OUT BY A COMPETENT PERSON OR PERSONS CONVERSANT WITH THE HAZARDS OF WORKING WITH ELECTRO-MECHANICAL SYSTEMS.

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SECTION 2 - DESCRIPTION

2.1 General Description

The M1000-6/USB signal conditioning cabinet is a multi-channel system that can accept signals from most types of transducers. These signals are conditioned, amplified and digitised allowing the direct connection to a computer via a USB port and also provides high level analogue outputs for each channel. The following features are included in all systems:

- Selectable Power supply for transducers
- Configuration switches, e.g. full, half or quarter bridge
- Individual gain and balance controls
- A digital monitor with channel selector
- An accurate calibration facility.

2.1.1 Signal Conditioning Cabinet

The M1000-6/USB contains internally all the necessary facilities to condition and acquire analogue signals in digital form and transfer these in real time to a computer. The cabinet can be used in a stand-alone mode with direct high level conditioned analogue outputs. The cabinet does not require programming, the control of data acquisition is performed in application software resident on the computer.

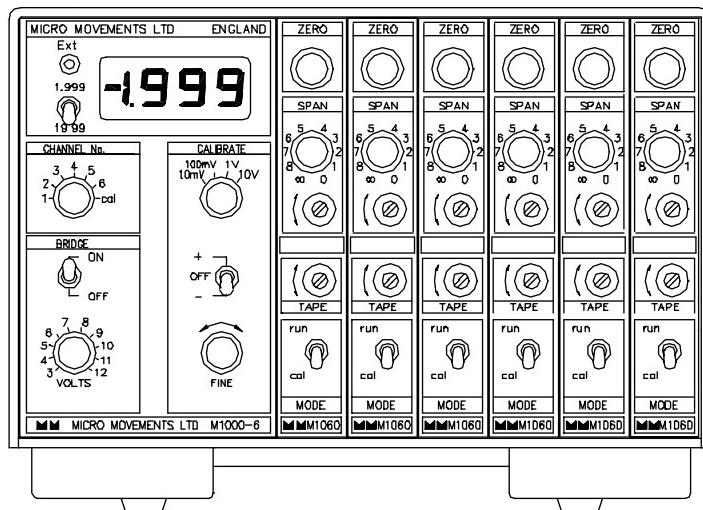


Figure 2-1 M1000-6/USB Front View

2.1.2 Signal Conditioning

Standard plug-in modules are available to condition Pressure, Temperature, Acceleration and Flow transducers, etc. Also available is a wide range of modules that have been designed for special customer requirements (see section 2.5).

2.2 System Operation

The block schematic of the signal paths is shown below in Figure 2-2. Each of the 6 standard inputs is via a rear panel 7-Pin DIN connector. The input signal is fed internally to a Signal Conditioner which is individual for each channel. The Signal Conditioner outputs a high level analogue signal (+/- 10 volts). This output is fed to a 15 way D-type socket on the rear allowing user access to these signals as an costed option. This same high level signal is also fed internally to an 8 channel Data Acquisition units (DAQ). The interface with the DAQ is via a rear panel mounted USB connector. An optional facility of Digital I/O is available on the rear panel. The software installation and hardware drivers that are supplied can be loaded on to a host computer (see Section 5). This allows the setting of channels and sample rates to be acquired to the computer.

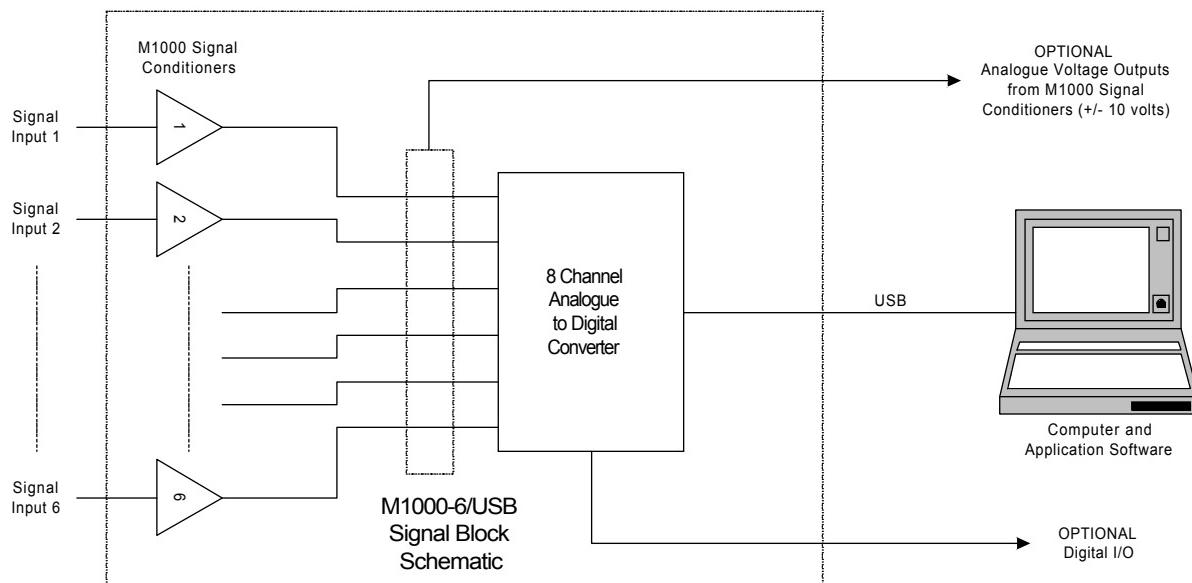


Figure 2-2 M1000-6/USB Signal Path Schematic

2.3 Applications

The cabinet has been designed to be used in conjunction with a computer. This could be desktop, laptop or industrial. This allows application software to run on the computer and gather digitised data on the computer hard drive and/or screen for real-time or post processing analysis.

The cabinet also has optional facilities for high level analogue output allowing it to be connected to a secondary data gathering system such as a DAT recorder or visual display, although usually these functions can be incorporated in the application software on the computer.

Micro Movements can provide application software. Standard solutions with Snap-Master or bespoke applications in Lab View.

If assistance is required with the selection of an appropriate computing device, Micro Movements Technical Supprt team is available to provide advice. It should be noted that if Snap-Master software is being used, the computer must have a Windows XP operating system

2.4 Specifications

Signal Input

7 pin locking DIN connector, one for each channel

Power Supply

115/230V 45-440Hz, selectable via rear panel control

12/24VDC

Power Consumption

25VA maximum

Operating Temperature

0°C to 40°C

Storage Temperature

-20°C to +70°C

Digital Monitor

3 1/2 digits

Range 1 - 1.999 volts

Range 2 - 19.99 volts

Calibration

±1mV through ±10 V continuously variable (Four switched attenuator ranges and Fine interpolation control).

Attenuator accuracy - 0.5%

Stability - 200 p.p.m./°C

Transducer Power Supply

3-12 VDC in 1V steps (alternative ranges available on request)

Analog to Digital Configuration

1 x 8 channel Analog to Digital Converters

Resolution

12 Bit (16 bit optional)

Sample Rates

48 K Samples/Sec maximum throughput for each 8 channel A/D

Typical 7 K Samples/ Sec on each channel for 6 channels

Maximum on 1 channel, 48 K Samples/Sec

Overall System Accuracy

Using Zero and Gain controls on Signal Conditioning can typically achieve Zero offset and ± 0.1% total accuracy.

Bandwidth

Dependant on Signal Conditioning Module, up to 20 KHz (-3 dB)

Signal Outputs (VOLTAGE)

Standard 15 Pin D

Special As required subject to space limitations

USB USB 2.0, connector Form A

2.5 Signal Conditioning Modules

The following signal conditioning modules are available for use with the M1000 Series.

M1020 Designers Module

A matrix-pattern printed circuit card contained within a standard amplifier module which enables non-standard circuits, “specials”, etc. to be utilised within the system. Input, output, power supplies, calibration, etc. are all accessed via the module connector.

M1043 Synchro/Resolver to DC Converter

Double width module for monitoring Synchro/Resolver outputs and providing DC proportional to angle. Rate output also available. May require external isolating or Scott transformers.

M1049 Oscillator/Amplifier/Demodulator/Filter

For energising and conditioning of variable reluctance transducers, differential transformers, AC-excited LVDTs, etc. With built-in continuously variable, stored calibration facility.

M1060 High Gain DC Amplifier

Differential Amplifier for use with most types of low-level transducers, e.g. strain gauges in 1, 2, or 4 active arm configuration, bonded and unbonded strain gauge transducers and load cells.

M1061 Thermocouple Amplifier

For use with thermocouples and similar low-level devices. Full scale output for 1mV to 100mV input.

Internal reference junction compensation with C1061K

C1061/K Connector

Special connector with integral cold junction compensation for above.

M1064 High Bandwidth Amplifier

Differential Amplifier for use with most types of low-level transducers, e.g. strain gauges in 1, 2, or 4 active arm configuration, bonded and unbonded strain gauge transducers and load cells. High gain-bandwidth. 100 KHz at gains of up to 1000.

M1070 Attenuator/Amplifier

General purpose unit for medium to high level inputs, e.g. potentiometric transducers, DC/DC LVDTs, servo accelerometers, tape replay amplifiers.

C1070/H Adaptor

High impedance adaptor, for operation of M1070 with piezo-electric sensors or signals with very high

source impedance.

C103 High Voltage Connector

With 60dB balanced attenuator network for measuring high input voltages (up to 1000V RMS).

C104 High Voltage Connector

With 80dB balanced attenuator network for measuring high input voltages (up to 1000V RMS).

C/NA Shunt Connector

For current measurement (N specifies the current). Range 0.1 to 10 amps.

M1073 RMS/DC Converter

Precision rectifier unit for monitoring amplitude changes in AC waveforms.

M1080 Frequency/DC Converter

For use with impeller flowmeters, magnetic or photo-electric RPM pickups, tachometers, vibration pickups.

M1085 Oscillator Module

Nine calibrated ranges from 20Hz to 10kHz (crystal controlled), for calibration of M1080.

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SECTION 3 - SET-UP

3.1 Installation

The M1000 Series Signal Conditioning System cabinets are portable and therefore not dedicated to one installation point. During use there are some simple precautions to follow if the system is to operate safely and correctly.

a) Supply voltage

Before connecting the cabinet to the power supply, check that the voltage has been set to the correct position for the local supply voltage and that the appropriate fuse has been fitted. The supply voltage is selected by means of a rotary switch located on the rear panel of the cabinet.

b) The top cover should not be removed except by qualified personnel.

c) It is essential that the air vents around the cabinet are not blocked while it is in operation, as adequate ventilation is required to prevent overheating.

The following items are supplied with each cabinet:

- 1 Mains power lead with moulded socket.
- 1 x 7 pin locking DIN connector is supplied with each signal conditioning amplifier ordered with the mainframe.
- 1 set of manuals.
- 1 x 2 metre USB lead (form A to A)
- 1 set software installation CD,s

3.2 Preparing for use

3.2.1 Computer

See Section 5 for details of how to set up your computer. This section includes installation of hardware drivers, installation of application software and the configuration of hardware drivers. The computer set up and configuration only needs to be performed once, before the first use. All settings are then retained on the computer in configuration files which automatically restore these settings each time the computer is switched on.

3.2.2 Basic set up

- a) Ensure the power switch is in the OFF position (located on the rear panel).
- b) Select the voltage of the power source using a screwdriver on the rear panel selector. The settings are:

DC - 12V and 24V

AC - 115V and 230V, 45 - 400 Hz

- c) Connect the power source to the appropriate socket on the rear panel. The left hand 4 pin socket is for the DC supply, the right hand 3 pin socket for the AC supply (see Section 4.2 for further details).
- d) Connect the 7 pin connectors to the signal input connectors (see Section 3.3 for connection details).
- e) Connect a D-type output connector to the voltage if required (see Section 3.3 for connection details).
- f) Connect the USB lead from the USB port on the cabinet to the USB port on your computer. This connection can be made before or after the M1000-6/USB has been switched on or after. The USB connection is completely hot-swappable

NOTE See Section 5 to install drivers and software on your computer before the first connection.

3.2.3 Operating Controls

Set the operating controls on the front panel to suit the requirement (see section 4 for the use of controls).

3.2.4 Switching on

Set the power switch to the ON position. The system should now be ready for use. When the M1000-6/USB is powered and switched on, the front LED display will be illuminated

3.3 Connection Details

The rear panel connector layouts are shown in Figure 3-1

3.3.1 Mains Input

This is a fixed socket with moulded free lead conforming to IEE regulations.

Europe:

Brown connects to Live
Blue connects to Neutral
Green/Yellow connects to Earth.

North America:

Black connects to Live

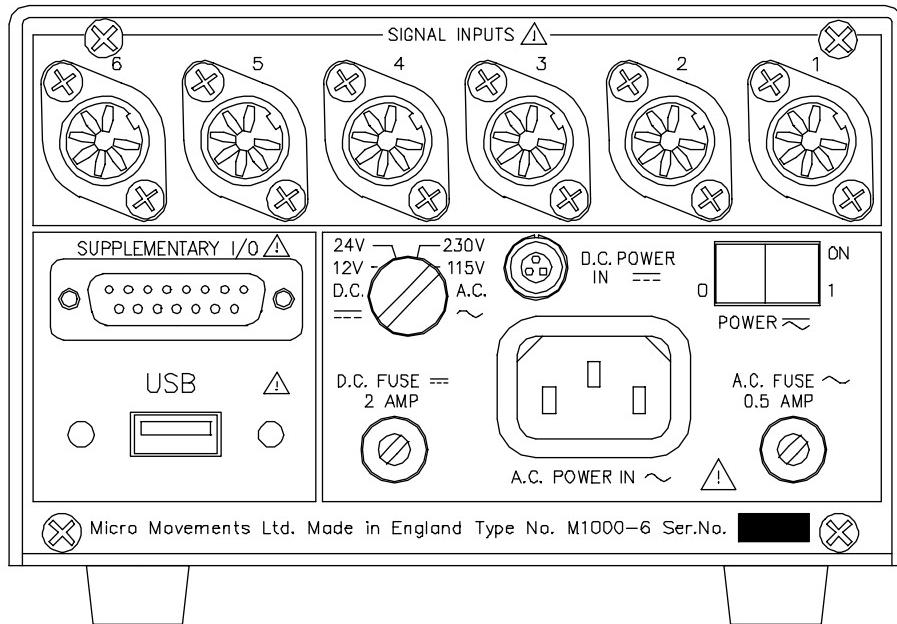
White connects to Neutral

Green connects to Earth.

Note: Set voltage selector to position for local supply with fuse value as follows:

220-260VAC - 0.5amp SLO BLO

100-130VAC - 1amp SLO BLO

*Figure 3-1 M1000-6/USB Rear View*

3.3.2 Signal Input

The 7 pin connections for the input signals to the conditioning modules must be correctly wired. Signal input pin connections are;

| Pin | Connection |
|-----|---|
| 1 | Transducer Supply +ve |
| 2 | Transducer Supply -ve |
| 3 | Not connected |
| 4 | Input LO |
| 5 | Input HI |
| 6 | Auxiliary Supply/Input |
| 7 | Chassis (when powered from mains via and IEC connector, the chassis is Earth) |

Note: The above connections only apply if there is a signal conditioner fitted to that particular channel.

3.3.3 Computer

The computer should be connected via the USB cable provided to a suitable USB port

3.3.4 Optional Supplementary I/O Connections

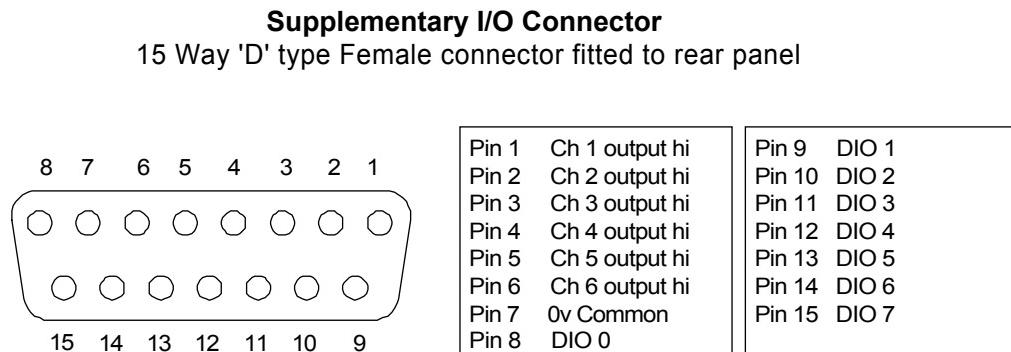


Figure 3-2 Analogue Signal Output Connector

3.3.5 A6 Inverter

The A6 Inverter is a factory installed option, which is available on all models, allowing DC operation of the systems. The connections and precautions listed below should be followed:

- i) Ensure that the mains lead is disconnected and set the Voltage Selector to the correct position.
- ii) Connect the DC supply (Battery) to the cabinet using the cable supplied.

Cable Specifications

| Nominal Area | Maximum Length |
|--------------|----------------|
| 6 sq. mm | 2M each lead |
| 10 sq. mm | 5M each lead |
| 16 sq. mm | 10M each lead |
| 35 sq. mm | 25M each lead |

Supply Voltage Range

| | |
|----------------|--------|
| Nominal 12VDC: | 11-14V |
| Nominal 24VDC: | 22-29V |

Nominal Current

| | |
|-----|---------|
| 12V | 1 amp |
| 24V | 0.5 amp |

SECTION 4 - OPERATION

The M1000 Series of instruments are configured to accept a range of plug-in signal conditioning modules and data amplifiers and can thus be used as completely self-contained data acquisition systems with a very wide range of transducers, such as load cells, thermocouples, strain gauges, pressure transducers, accelerometers, flowmeters, displacement transducers etc..

The controls described in this section are adjusted in conjunction with the conditioning module controls to set the system for use. Their operation in most cases is self evident, however some details need explanation. For further details of the conditioning controls, calibration and set up refer to the individual conditioning module User Guides.

4.1 Front Panel Controls

Figure 4-1 shows the front view of the M1000-6.

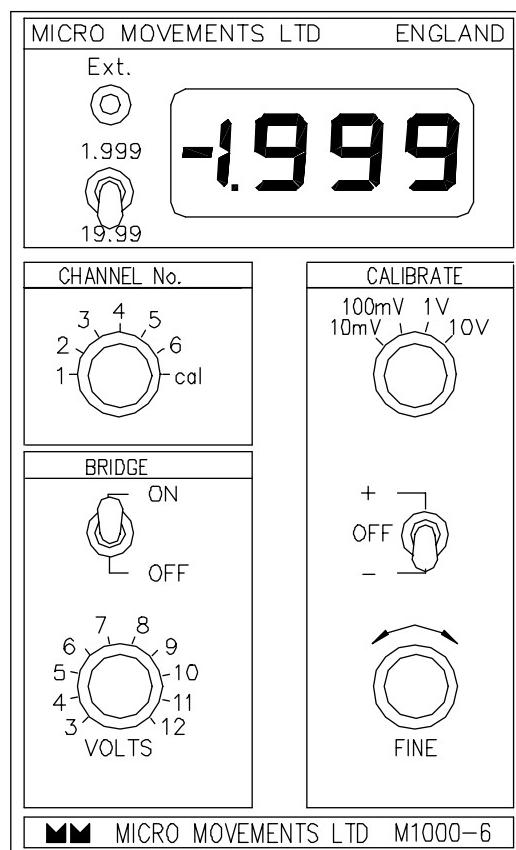


Figure 4-1 Front panel of M1000-6/USB

Monitor

The monitor displays one line of data:

- A 3 1/2 digit voltmeter with auto polarity which is used to monitor either the voltage output from any signal conditioning module or the output from the calibrator.

1.999/19.99

This is the Voltmeter Range Selector switch. The maximum value that can be displayed is represented by the two switch positions, 1.999 and 19.99.

Channel

This switch is used for channel selection and displaying the Calibration Voltage value

A rotary switch to select channels 1 to 6 and CAL

Bridge

The two switches in the BRIDGE box control the output of the Transducer Power Supply.

The rotary switch selects the voltage of the power supply between 3 and 12 volts in 1V increments and the toggle switch is an ON/OFF control.

Calibrate

In the CALIBRATE box there are two switches and a potentiometer to control the M1016 calibrator. The range switch is a four position rotary switch with the ranges 10mV, 100mV, 1V and 10 volts. The three position toggle switch gives three values of calibration:

Positive, OFF and Negative.

The fine gain potentiometer allows adjustment of the calibration voltage to any value. The calibration can be set utilising the monitor in the CAL position. To set a small voltage accurately adjust the value on a higher range of the rotary switch and then turn to the lower range.

e.g. If a value of 4.32 volts is set on the 10V range and the rotary switch is turned to the 10mV range, a voltage of 4.32mV will appear at the input to the amplifiers. More details can be obtained from the calibration section contained within the individual module User Guides.

4.2 Rear Panel Controls

- Input Connectors - 7 pin DIN. (See section 3 for connection details).
- Supplementary I/O (Option) - Female D connector contains high level voltage from each of the signal conditioning channels and Digital I/O. (See section 3 for connection details)
- Voltage Selector - Rotary switch for selection of required supply voltage, 12VDC, 24VDC, 115VAC or 230VAC.
- DC Fuse - 2 amp, 5 x 20mm fuselink.
- DC Power In - 3 pin Lemo connector
- AC Power In - standard IEC socket.
- AC Fuse - 0.5 amp, 5 x 20mm fuselink.

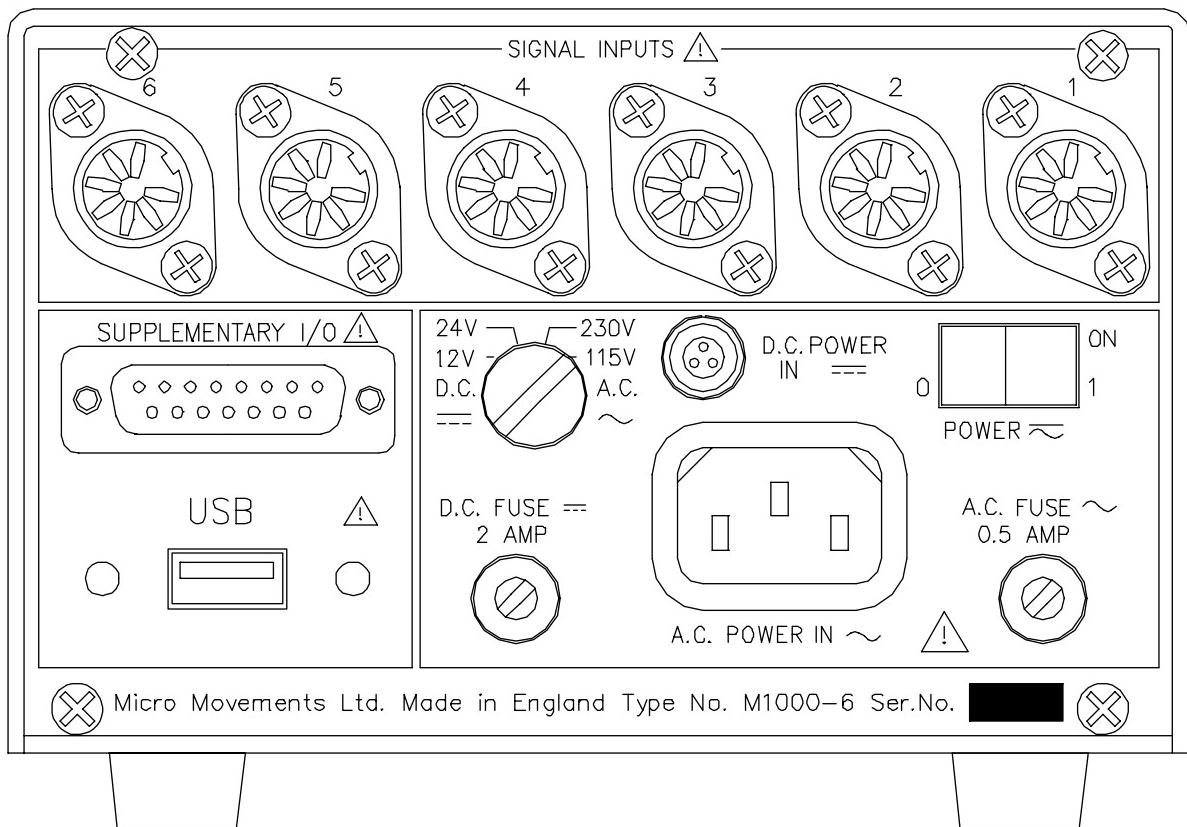


Figure 4-2 M1000-6/USB Rear Panel Controls

Section 5 - Installation Guide

M1000-6/USB and Snap-Master

5.1.1 Introduction

This document is to guide those users who are using a Micro Movements M1000-6/USB and wish to install the drivers and Snap-Master software on their own computer. You can always send your computer to us and we will install these for you.

5.1.2 Overview

The M1000-6/USB contains an 8 Channel USB powered data acquisition unit. This requires hardware drivers to be loaded so that the computer can communicate. The basic hardware driver is Universal Library, Instacal.

If you are writing your own applications in Delphi, C++ or Visual Basic, there are driver interfaces and example code available when installing Universal Library.

If you are writing your own application in Lab View, there is a separate driver CD available, UL for Lab View, which needs to be installed.

If you are using Snap-Master software, then this will need to be installed from the CD provided.

Once all the required driver and application elements are installed, it is necessary to configure the hardware drivers and the application software to interface correctly. This does not require any programming **and only needs to be done once on the first install**. After this your equipment will function without the need to reset any drivers or interfaces as all the initial settings are stored automatically internally in .cfg or .cnf or .ini files which are reloaded when you switch your computer on.

5.1.3 System Requirements

A computer, (Laptop, Desktop or Industrial) with Windows XP operating system. As long as the computer is configured optimally for Windows XP this should cover the requirements for performance. Must have one spare USB 2.0 Port.

5.1.4 Technical Support

For technical support on this product, contact Micro Movements Ltd.

+44 0118 973 0200 or e-mail info@micromovements.co.uk

5.2 Hardware Driver Installation

5.2.1 Installing Universal Library

It is first necessary to install Universal Library. Switch your computer on and put the CD marked “Universal Library” into the CD/DVD carriage. If the CD does not Autorun, then using Window Explorer, go to the root directory of the CD and double click on INSTALL.EXE. The installation will now commence and you will be presented with an Options screen. If you are installing Snap-Master or Lab View then you do not require any of the install options shown below and should ‘Clear All’ before proceeding. You should follow all on screen instructions and accept defaults unless you are certain you require some alternative. Re-boot the computer if and when requested. Universal Library is now installed.



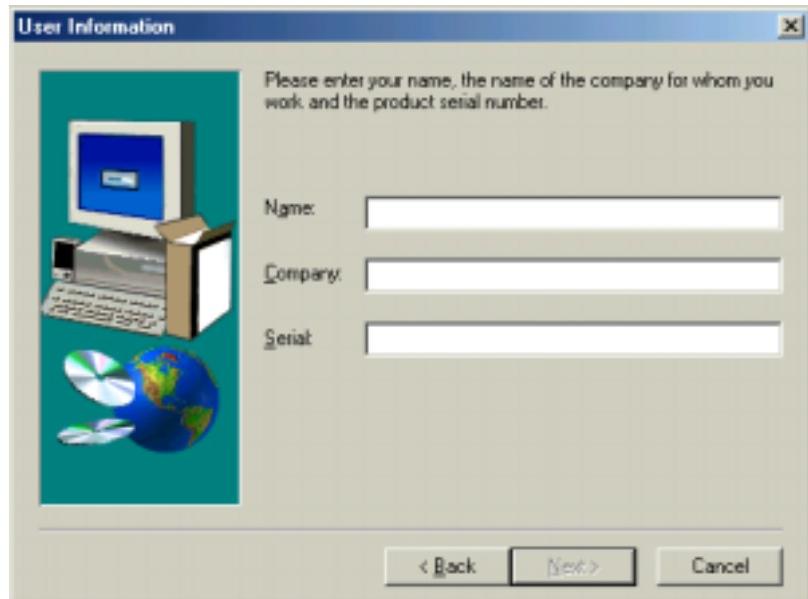
5.3 Software Installation

5.3.1 Installing Snap-Master Software.

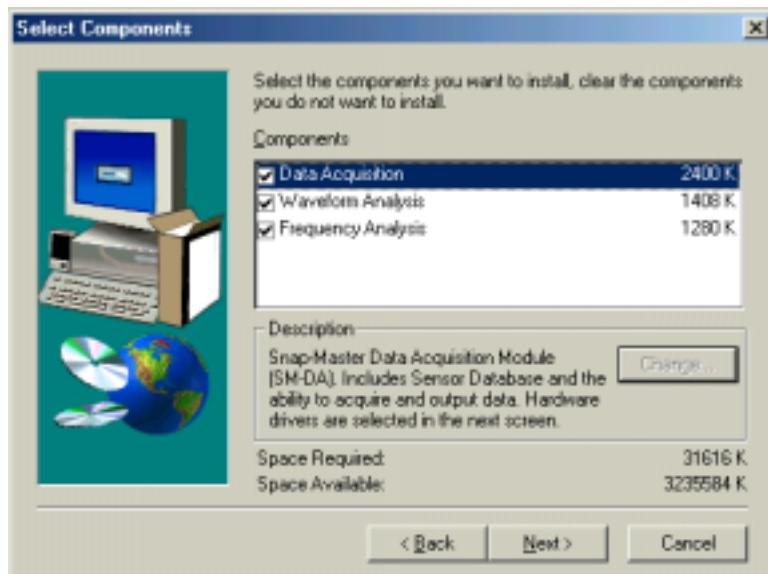
Switch the computer on and load the CD containing your Snap-Master license. This CD will be provided containing the elements you have ordered. The three possible elements are:

SM-DA; Data Acquisition Software, SM-WA; Waveform Analyser Software and SM-FA; Frequency Analyser Software. If the CD does not Autorun, then using Window Explorer, go to the root directory of the CD and double click on SETUP.EXE. The installation should now begin.

The first entry screen requests information to be entered about the user. These fields must be completed. This screen also requests the entry of the License Serial number, which can be found on the front of the installation CD.



The next screen asks which components you wish to install. Usually this will be all of the components on the CD. The default automatically checks all items, you need to uncheck any that you do not wish to install.



The installation will now request which hardware interfaces are required. This relates to the hardware contained within the M1000-6/USB and interfaces with the Universal Library drivers previously loaded. Select only the 'Measurement Computing' item. Any others selected will not interfere with the functioning but may add confusion and will waste hard disk space.



The installation will now automatically complete and provide a termination message. It will be necessary to shut down your computer and restart. Depending on the software version this may be automatic.

5.3.2 National Instruments Lab-View

The hardware in the M1000-6/USB is Lab-View compatible. If you wish to use this hardware with Lab-View, please request the free CD containing Lab-View interface drivers and examples.

5.4 Initial Configuration

5.4.1 Configuring Instacal Hardware Drivers

When all the above drivers are installed it is necessary to perform a once-only configuration.

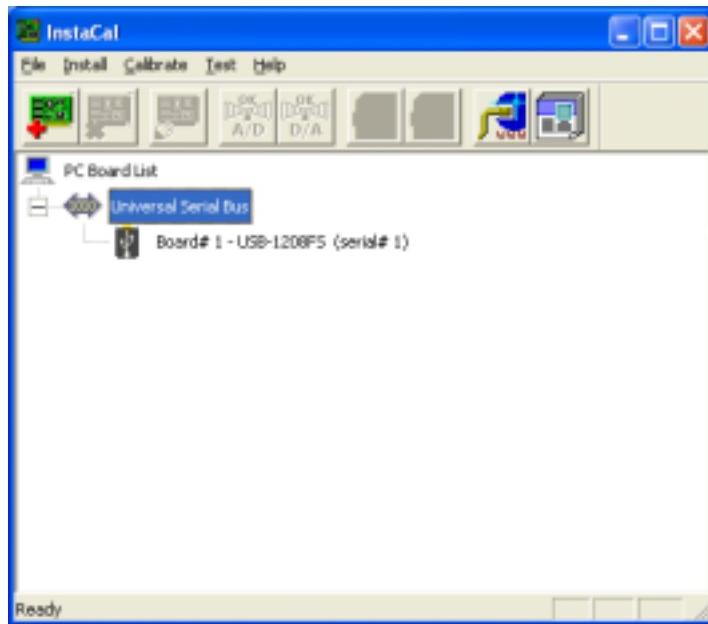
Firstly, with your computer switched on, connect the M1000-6/USB from the rear panel USB port to an unused USB port on your computer. Windows XP should automatically detect new hardware, indicate that it is finding and loading drivers for a Human Interface Device and advise when it has completed loading with a message that the new hardware is now ready for use.

Once this has occurred, select the Programs menu and open Instacal, from the Measurement Computing group. Instacal will load and automatically detect the USB devices attached and display the following message.



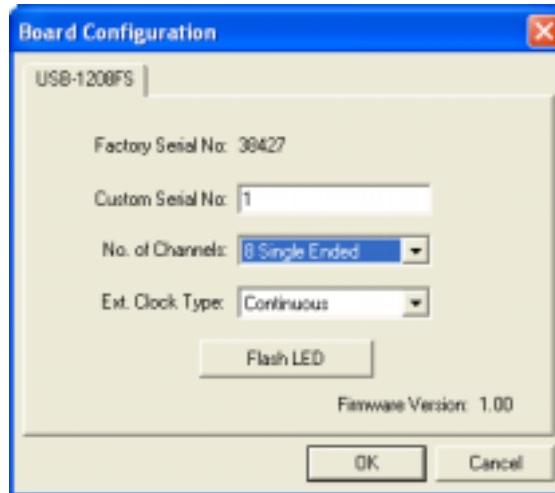
Click on OK, to accept these devices which are internal to the M1000-6/USB. It is now necessary to configure the devices.

This is done from the main Instacal screen as shown below.



Point the mouse at one of the two boards and click the right button. Select, ‘Change Board Number’ and alter the value so that USB-1208FS (serial#1) is Board 1. This provides a unique system reference for application software.

Now select Board 1 and from the right click menu, select ‘Configure’. From the ‘No. of Channels’ element, select ‘8 Single Ended’, then OK. Do not adjust any other values.

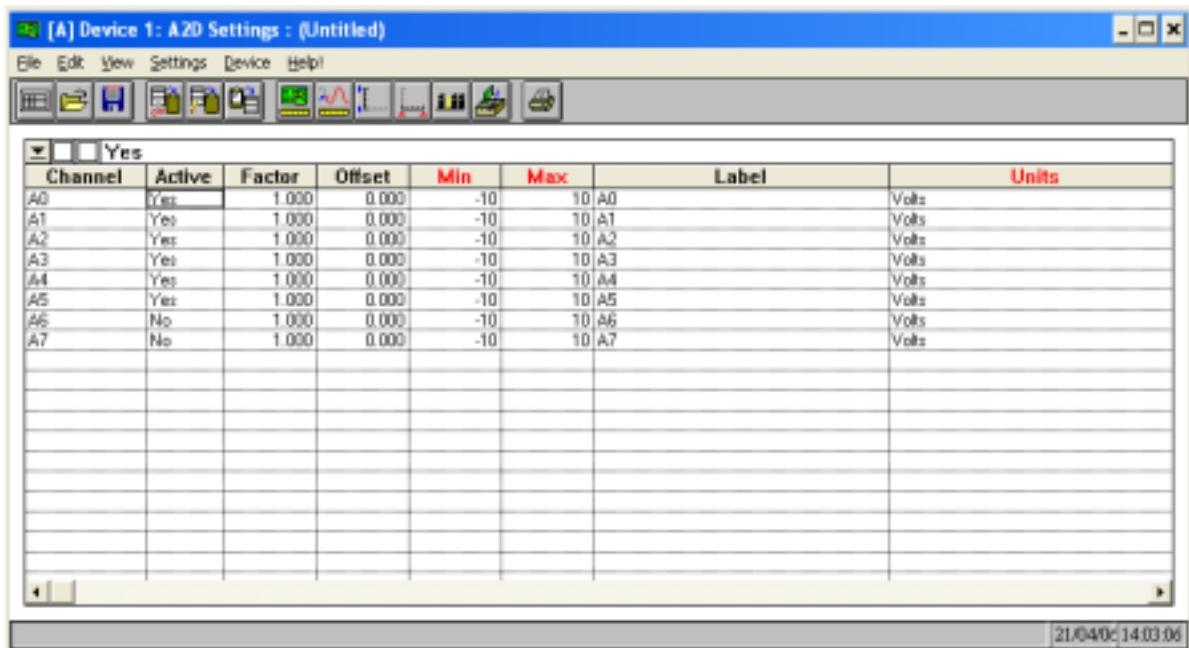


Exit from Instacal, as it is now configured. The values previously entered are now stored in a config. file. This file is used by Snap-Master to access the hardware devices and their settings.

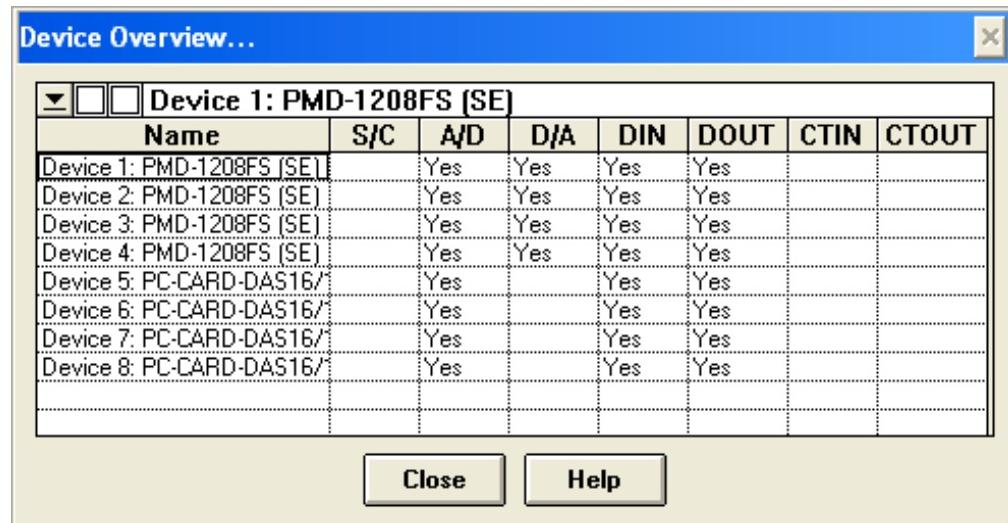
5.4.2 Configuring Snap-Master Driver Interface

It is now necessary to perform an initial configuration of Snap-Master. From the Programs menu, select HEM Data and Snap-Master. For additional information on the use of Snap-Master, refer to the User Guide, which is provided in PDF format on the Snap-Master CD.

From the top menu, select File, New Instrument. You will be presented with a blank work area. Point the mouse at the green A/D element in the leftmost column (third down from the top). Hold down the left mouse button. A small display should appear by the mouse pointer showing the installed hardware drivers. Measurement Computing A/D, should be checked. Drag this element onto the work area. Now double click on this element and a dialogue page should open as shown below.



From the menu, select Device, Hardware Overview, which should result in the following screen.



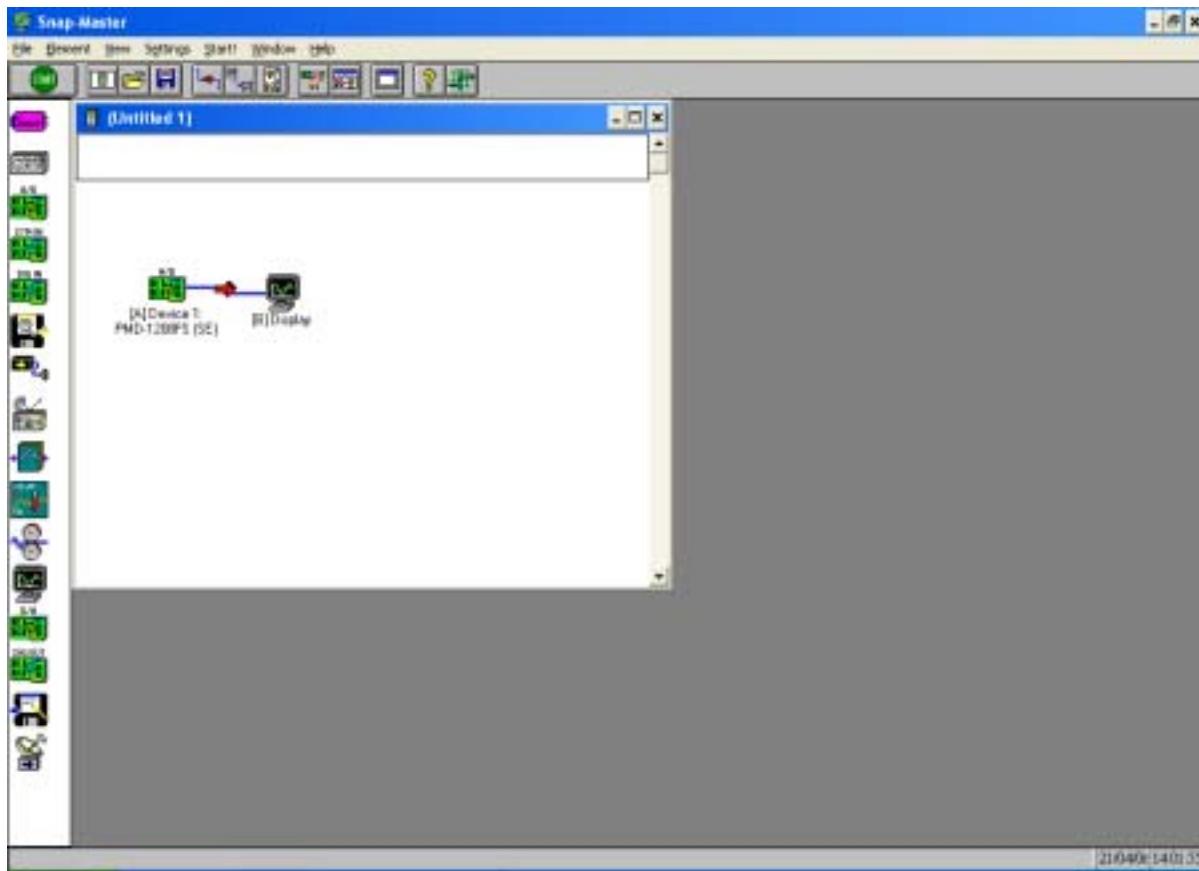
Select Device 1, as shown and from the pull-down arrow list, double click on PMD-1208FS (SE). For this application, Devices 2 onwards are not relevant and can be left at default. If you are using more than one M1000-6/USB consult the factory for further information.

Select Close. On the A2D Settings menu the view should look as above. Close the Settings menu.

5.4.3 Getting Started

You have now completed the initial configuration of Snap-Master together with the hardware drivers. These steps should not need to be performed again. Instacal need never be opened again. Each time you plug in your M1000-6/USB, Instacal will automatically detect and configure in the background. You will not see anything displayed. The configuration of Snap-Master was to tell it which hardware to work with and allocate the correct settings. It also stores this information in an internal config. file which will function automatically in the background.

To complete the steps to a functional Virtual Instrument; drag a Display element onto the work area and join the elements together using the Pipe from the top menu. It should now look like the picture



above. Press the Start Button. Channels 1 and 6 of the M1000-6/USB will be displayed on graphs. Refer to the M1000-6/USB User Guide and the Snap-Master User Guide for further information. Both of these will be in PDF format on your Snap-Master CD.

